Computer Algebra and Particle Physics

Sven-Olaf Moch

Universität Hamburg

– Computer Algebra and Particle Physics 2025, Hamburg, March 24, 2025 –

CAPP school

International School on

Computer Algebra and Particle Physics
CAPP 2025

24–28 March 2025
at University Hamburg

The CAPP school combines theory and practice in an advanced environment. It provides education and training of students and young researchers at graduate and Ph.D. level on central topics at the interface of modern computer algebra and particle physics. The courses include exercises and practical hands-on training with modern software.

Lectures and Courses

Bakar Chargeishvili (KIT Karlsruhe)	*Introduction to FORM*
Thomas Hahn (MPI München)	*Mathematica, FeynArts, FormCalc and all that*
Vitaly Magerya (CERN)	*Multi-loop Feynman diagrams on a computer*
Peter Marquard (DESY)	*Feynman integrals*
Sven-Olaf Moch (Uni Hamburg)	*Introduction to Computer Algebra*
Ben Ruijl (Ruijl Research)	*Introduction to Symbolica*

Organizing Committee: S. Moch (University Hamburg), P. Marquard (DESY), Secretary E. Monteiro Duarte (University Hamburg)
The school fee is 150 Euro. Registration deadline is 15 February 2025.
For more details and in order to register, please go to the school home page https://indico.desy.de/event/CAPP2025

DFG research unit FOR 2926

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

CLUSTER OF EXCELLENCE
QUANTUM UNIVERSE

Idea for the CAPP series

History

- 1^{st} event in 2005 at DESY, Zeuthen, organized by T. Riemann & S.M.
- Bi-annual series with $\mathcal{O}(50)$ participants
- Since 2015 hosted in Hamburg, organized by P. Marquard & S.M.
  - 2021 online
- CAPP 2025 is the 11^{th} event
  - in presence, also with online stream

Motivation

- Bridge gap between university education and forefront of research
- Provide training in tools for big calculations in perturbative quantum field theory (of course, notion of 'big' changes over time)
  - 'big' in the early 2000's meant expressions of $\mathcal{O}(1)$ GByte and CPU times of $\mathcal{O}(1000)$ hrs
  - 'big' in the 2020's implies expressions of $\mathcal{O}(10)$ TByte and CPU times of $\mathcal{O}(1.000.000)$ hrs

CAPP 2025

Program of CAPP 2025 (cast in order of appearance)

- Introduction to Computer Algebra — S.M.
- Introduction to FORM — B. Chargeishvili
- Introduction to the calculation of Feynman integrals — P. Marquard
- Mathematica, FeynArts and FormCalc and all that — T. Hahn
- Introduction to Symbolica — B. Ruijl
- Multi-loop Feynman diagrams on a computer — V. Magerya

https://indico.desy.de/event/CAPP2025

Technicalities (I)

- Support
  - Elizabeth Monteiro Duarte (secretary)
  - S.M.
- Work
  - WLAN access: eduroam or SSID Science-Hotspot
  - your equipment:
    notebook with Maple, Mathematica and compilers (Fortran, C, C++)
- Venue
  - Monday, Tuesday, Thursday, Friday (building 1b, seminar room 4a/4b)
    $\longrightarrow$ here
  - Wednesday (building 2a, seminar room 2)
    $\longrightarrow$ across the street, ground floor

Technicalities (II)

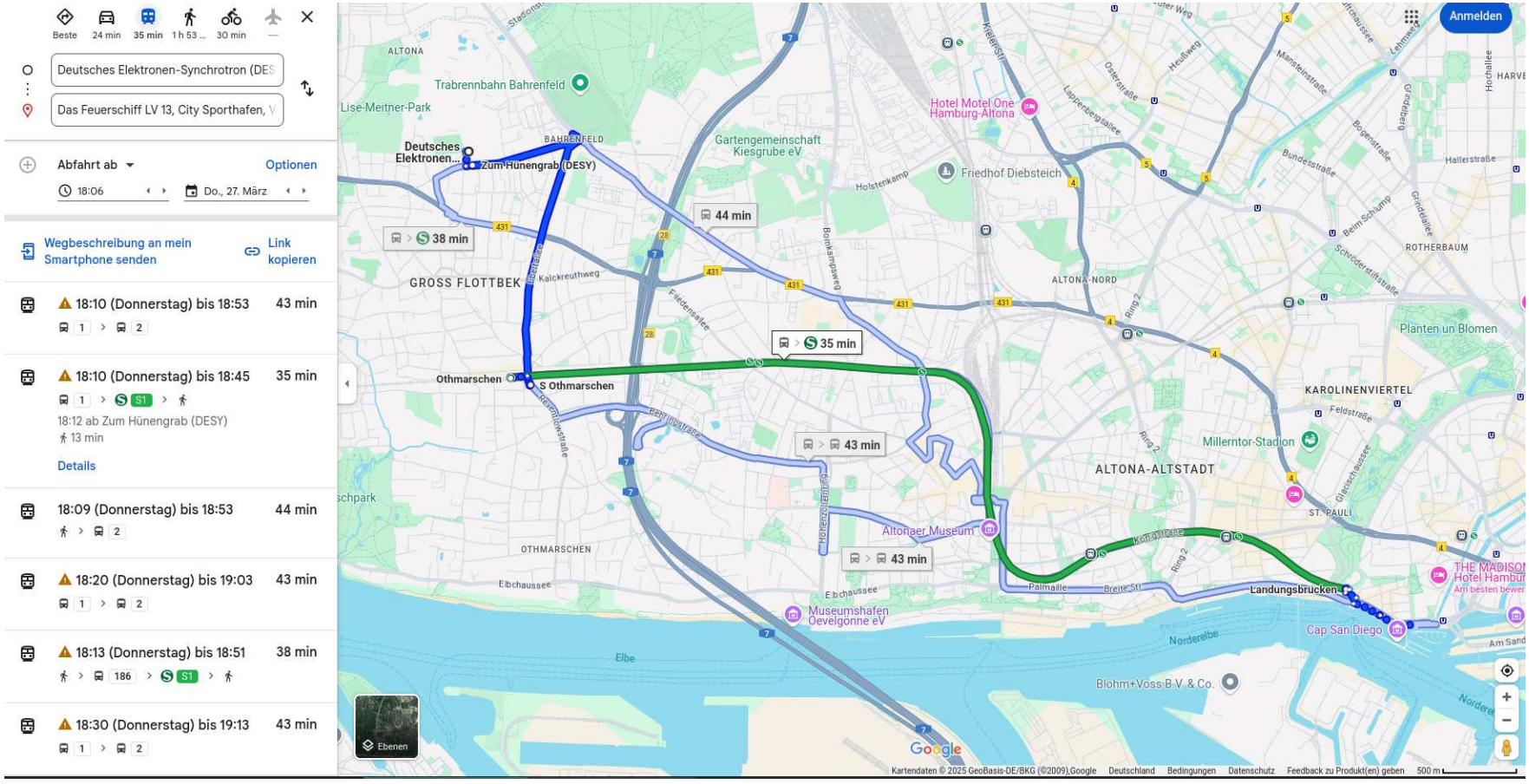
- Food
  - coffee breaks always in foyer (in front of seminar room 4a/4b)
  - lunch in cantine
    - discount for Hamburg Univ. students: show your student ID

Social program (I)

- Shorter lunch/coffee breaks on Thursday afternoon to finish 16:45 hrs
- Social dinner on Thursday evening 19:00 hrs at restaurant **Das Feuerschiff**
  https://www.das-feuerschiff.de

Social program (II)

- Directions
  - public transport from DESY to harbor approx. 45 min



Technicalities (III)

- Hamburg University students
  - Credit points for M.Sc. course will be granted
  - Eligibility for grading:
    - attendance and active participation during the week
    - written report (5-10 pages LaTeX) on a lecture topic of your choice (teams of two are OK)
    - reports to be handed in as pdf-file by email to sven-olaf.moch@desy.de
      deadline: Sunday, April 13th, 2025, at 24:00 hrs

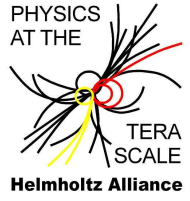
Sponsors

- Universität Hamburg

- DESY

- DFG research unit FOR2926
  Next Generation Perturbative QCD for Hadron Structure: Preparing for the Electron-Ion Collider

- Helmholtz Alliance *Physics at the Terascale*



- Cluster of Excellence *Quantum Universe*

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